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FURTHER NOTE UPON COMPARISON OF *ENDAMOEBA*
GINGIVALIS (GROS) AND *ENDAMOEBA*
HISTOLYTICA SCHAUDINN

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In a recent number of this Journal¹ the writers, after an analysis of the records of discovery of parasitic amebae in the human mouth concluded that the oral endamebae of man are referable to two species: *Endamoeba gingivalis* (Gros 1849) and *Endamoeba pyogenes* (Verdun and Bruyant 1907). In an attempt to compare these oral parasites with other parasitic amebae of man the writers suggested that the second species named may be identical with an organism, characterized like it by a large nucleus containing a large, granular, richly chromatinized binnenkörper, found by Ribbert in the ducts of the parotid gland, and believed by the writers to be the same as found some years ago by Ribbert in the renal tubules of a syphilitic new-born infant, by Jessionek and Kiolemengolou in the kidneys, liver, and lungs of an aborted syphilitic fetus, and by Smith and Weidman in the kidneys, lungs, and liver of a non-syphilitic new-born infant and in the lungs of a syphilitic infant one month old, to which these last writers have applied the name of *Endamoeba mortinatalium*. (For literature cf. original article in this Journal.¹) In comparing the first named species of oral endamebae with *Endamoeba histolytica* Schaudinn, the writers asserted so close a morphological similarity that, while unwilling to declare the biological identity of these parasites, they felt unable by microscopic examination alone to differentiate between them. Emphasis was laid in a footnote, added to the paper after its presentation at the Christmas convocation of 1914 before the Association of American Bacteriologists and forwarded with the copy for publication, that this statement had reference to *Endamoeba histolytica* solely in its *histolytica* phase (not the *tetragena* phase); and the same footnote contained a brief record of failures of feeding experiments, thus adding reason for believing in the duality of the species altogether apart from the morphological similarity presented. Unfortunately this footnote was omitted in printing; and through oversight an editorial note, written following a discussion by correspondence, was inserted, emphasizing the *tetragena* phase of *Endamoeba histolytica* as a basis of differentiation and urging the known

1. Jour. of Parasitol., June, 1915, vol. 1, pp. 159-174.

reproductive encystment in this latter phase as a point in separation. The writers have felt that thereby their position has been the more opened to misconception, and through the kindness of the editor are publishing the present note to amend and define their original statement, and at the same time to record briefly their attempts to induce colonic infestation by oral endamebae.

In the *histolytica* stage of *Endamoeba histolytica* Schaudinn the parasite is known to divide by fission and, many at least believe, also by gemmation, but there is no reproductive encystment. In the *tetragena* stage of the same parasite the true encystment with four offspring occurs. In the *histolytica* stage the nucleus is practically invisible in the unstained state; in the *tetragena* stage it becomes visible unstained, and when stained shows a thicker nuclear membrane, a larger binucleus and a higher chromatinization. *Endamoeba gingivalis* simulates the first of these phases in its nuclear characters and in its apparent modes of reproduction. It is of course to be expected that sometime and somewhere reproductive encystment does take place; and it is not impossible that in some other situation than in the gums a phase is assumed comparable to the *tetragena* phase of the dysenteric organism, in which reproduction in encystment occurs. We say "elsewhere than in the gums" because we have not noted examples suggesting such change in the pyorrhea material from the many individuals whose parasites we have seen; and a large proportion of these cases was decidedly chronic (the element of chronicity apparently being important to the assumption of *tetragena* characteristics and to encystment reproduction in case of *Endamoeba histolytica*). As far as the question of gemmation is concerned doubt of course is natural. But the writers are not satisfied that the separation of gemmules is merely a phenomenon of degeneration. We have repeatedly seen the throwing off of gemmules by actively moving and apparently normal amebae, and especially in our attempts to cultivate the oral endamebae *in vitro* have found what we believed to be such gemmules in motion, and in stained preparations of the same material similar small protoplasmic bodies containing a minute bit of chromatin. We cannot, of course, declare the fate of these separated particles, but the appearances observed certainly make us unwilling to accept unhesitatingly the view of their inability to grow into adult amebae.

From the morphological similarities of *Endamoeba gingivalis* and the *histolytica* phase of *Endamoeba histolytica* and the occurrence of binary fission and gemmation as modes of reproduction of both (with no reference to the *tetragena* phase of the latter and its known mode of encystment reproduction), the writers held that methods of differentiation other than by comparison of morphological features are essential for differentiation. Since the presentation of the original paper we have

accumulated negative evidence indicating the duality of these oral endamebae and the dysenteric parasites, in the constant failure of attempts to infest the colon with pyorrhea material rich in *Endamoeba gingivalis* Gros. In these experiments, in which we were joined by Dr. Baldwin H. Lücke, assistant instructor of pathology in this laboratory, pyorrhea material bearing active vegetative endamebae was given to two kittens by feeding, to two puppies and two kittens by high rectal enemata, and to four kittens by injection into the colon after laparotomy. In all cases we failed to find amebae in the dejections and to note any evidence of dysenteric symptoms, and in all but two kittens to meet at autopsy with lesions of the colon at all suggestive of success. In these last a few ulcers were met, but smears made from the surface of the ulcers, and serial sections of the lesions, failed to show the presence of amebae. Such failures are not infrequent, it is true, when material known to contain *Endamoeba histolytica* is employed; and a single positive result would outweigh the negative results of our attempts. But because of the uniformity of failure of our experiments we feel that the original impression of biological difference between the species must be maintained in spite of the morphological similarities presented. With such a belief we are disposed to say in spite of the possibility of complete morphological similarity of individual examples of *Endamoeba gingivalis* (Gros) on the one hand and of the *histolytica* type of *Endamoeba histolytica* Schaudinn on the other, that one should in general find that individuals of *gingivalis* are slightly smaller, somewhat less active, with pseudopods commonly more lobose, with a nucleus more frequently central in position, and with a more actively hemolytic capacity (more rapidly destroying englobed erythrocytes and therefore ordinarily showing fewer red cells in the body of the parasite) than will be the case with individuals of *Endamoeba histolytica* in the *histolytica* phase and that intestinal infestation by *gingivalis* is probably impossible. We accept without hesitation the existence of definite differentiating morphological features to separate the oral parasite from the *tetragena* phase of *Endamoeba histolytica*.